A Comparative Study on the Effects of Size and Sources or Traceability on the Price of Identified Fish Species Sold at Muñoz Market, Quezon City

Jianna S. Gapuz, Mikhail Aleksandr B. Ruelos, Derek Colbee B. Uy and Mikhael Rafael Miguel C. Yao
De La Salle University Integrated School, Manila

Abstract: The diversity of fish in markets is constantly dynamic under several factors. The study aims to find the correlation of these factors and their effects with the selection of fishes found in Muñoz Market. This study adopted the research design of the two previous studies to ensure consistency in assessing the gathered data. The researchers utilized premade questionnaires that were given to the vendors working inside Muñoz Market. In analyzing the data, the researchers applied Pearson's correlation coefficient to assess the factors' correlation between them. The results showed an increase in the number of identified species and the price and size range of the fish placed in the market. This implies that the domain of the market is constantly increasing. The market is more diverse than in the past, where new species are introduced to the market and made accessible to the general public at Muñoz Market.

Key Words: fish diversity; aquaculture; marine biodiversity; Muñoz Market; Philippines

1. INTRODUCTION

Fish are a significant component in consuming a regular Filipino's diet, being highly associated with a reduced risk of coronary diseases due to their high protein and omega-3 fatty acid content (Soluta, 2021). Because of the versatility of fish, namely its accessibility, nutrition value, and affordability, Filipinos all around the islands include fish in their list of provisions and daily diet. Fish do not only play a vital role in the consumption of Filipinos and hold a significant contribution to the country's livelihood in terms of being an occupation (BFAR, 2020). The marketplace is an environment where these two elements collide. A majority of fish that Filipinos allocate for consumption are bought in markets or wet markets. In light of this, one would speculate the factors that affect the diversity of fish that make it into the actual market.

This paper is a third-iteration study concerning the diversity of fish, specifically in Muñoz Market, Quezon City. The first being a study by Arcangel, Caleja, Ignao, and Orejudos in 2019, the second being a study by Valenzuela, Veluz, Villanueva, and Villarama in 2020, and this study in 2021. Both studies being equally comprehensive, distinct, and well-advised, the conclusions and analyses of both papers provided well-rounded and intricate insights on said topic. However, the observations collected by both papers are not constant.

The state in which the fish markets and wet markets are constantly changing due to external factors such as climate, the economic state, the financial state of the consumers, the location, the season, and several others (Santos, Barut, & Bayate, 2017). There are natural, uncontrollable factors that contribute to the changing markets. However, some factors can be managed, such as the administration of the fishermen here in the Philippines. Given that fishers play a significant role in the economy, the issue concerning the security of the fishermen with the government is at large. Fishers are not given the due amount of care or protection when it comes to their welfare. Studying the trends and parameters inside the markets allows the monitoring of the effects of said disputes. It can inform the authorities about what is critical to protect the Filipinos' rights and the economy and help improve its state as of now.

This study aims to not only determine what factors cause direct or indirect changes to the variety of fish available in the Muñoz wet market but also analyze the trends and parameters of the fish within Muñoz Market with the past two studies by deriving patterns and trends in the fish's attributes and traceability.

The specific objectives of the study are as follows:

a.) Determine what factors cause direct or indirect changes to the diversity of fish available in the Muñoz wet market.
b.) Examine the parameters of the fish within Muñoz Market in comparison to the past two

studies by deriving patterns and trends in the fish's qualities and traceability.

2. METHODOLOGY

The primary source of data for this study were the stakeholders and fish vendors of Muñoz Market, located in Muñoz, Quezon City. An overview and a street perspective of Muñoz Market can be found in Figures 1 and 2, respectively.

Figure 1. Overview of Muñoz Market

Figure 2. Street view of Muñoz Market

2.1. Research Design

This research followed a quantitative design to gather numerical data from the aquaculture, specifically fishes, observed in Muñoz Market. The data was collected through a series of surveys where the respondents were required to fill in the size (mm), price (pHp/Kg), and source (location) of the fish. The data collection of this study was conducted from December 2020 - February 2021, or 13 weeks.

Shown in Figure 3 are the factors considered in obtaining the results for the correlation and comparison study of the fish diversity in Muñoz Market.

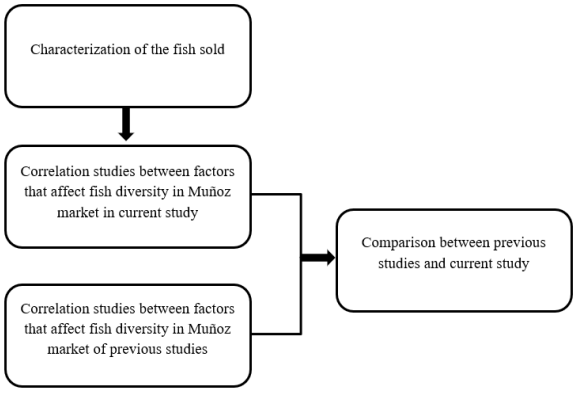

Figure 3. Theoretical Framework

2.2. Data Analysis

The results were tabulated utilizing Microsoft Excel, organized according to the code given in the survey form, which includes the length, price, and the source.

2.2.1. Analysis of Present Results

The initial observations from the data collected were summarized to provide an overview of the fishes included in the correlational studies.

2.2.2. Comparison of the Present Results with the Previous Studies

This study compared its findings with the two previous studies to see any consistent trends or notable differences.

2.2.3 Correlation Study

The researchers performed a correlational study between the size and source and its effects on the price of the fish to assess their relationship with each other individually. The correlation between the factors above was evaluated using Pearson's correlation coefficient (Equation 1). This was used in this study to ensure consistency in assessing parameters in line with the two previous studies.

$$r = \frac{n\left(\sum xy\right) - (\sum x)(\sum y)}{\sqrt{\left[n\sum x^2 - (\sum x)^2\right]\left[n\sum y^2 - (\sum y)^2\right]}}$$

Where n is the number of paired values, Σ xy is the sum of the products of paired values, Σ x is the sum per family, Σ y is the sum per family, Σ $x2$ is the sum of squared x values, Σ $y2$ is the sum of squared y values.

The parameters that were correlated include (a) the average price and source per family, (b) the average price and source per species, (c) the average

size and average price per family, and (d) the average size and average price per species.

3. RESULTS AND DISCUSSION

Discussed in this section are the obtained results and observations from the 13-week data collection period. This segment includes the comparison with previous results, the analysis of the current developments, and the correlational studies between the factors.

3.1. Analysis of Present Results

This section discusses the present results regarding the species, their respective sizes, prices, and sources. There were 74 individual species identified which were classified into 29 different families. The prices ranged from Php 90- Php 1200. The length of the observed fishes ranges from 40-890mm, and their average lengths per family are shown in Figure 4. The family Belonidae showed to have the highest value length among all families, averaging at 880.87mm.

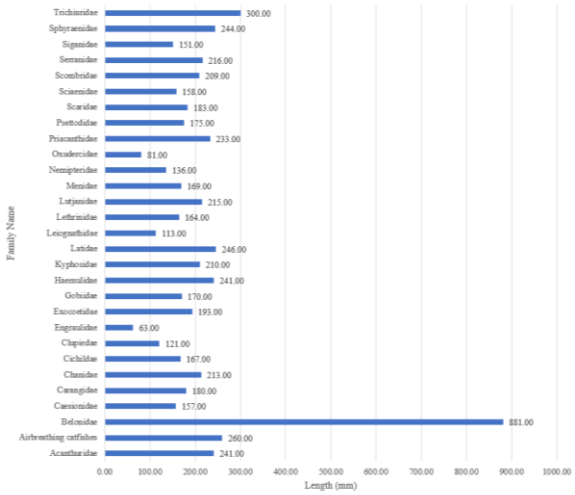

Figure 4. Average Length of Fishes per Family

There were seven sources of fishes identified, namely Lucena, Quezon, Farmers Quezon City, Malabon, Navotas, Batangas, and Dagupan. The primary source in this study is Lucena, totaling to 39% of the observed fishes. A visual representation of the sources can be found in Figure 5.

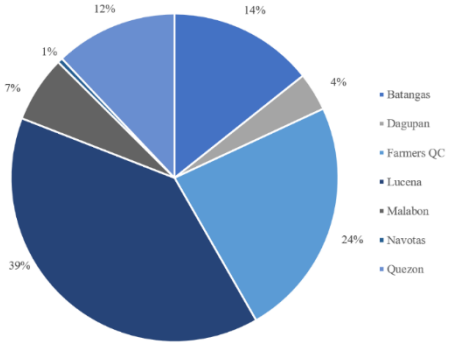

Figure 5. Sources of Fishes

3.2. Comparison of the Present Results with the Previous Studies

Presented in Table 1 is the summary of results in comparison with the two past iterations of this study.

Parameters	Arcangel, Caleha, Ignao, & Orejudos (2019)	Valenzuela, Veluz, Villanueva & Villarama (2020)	Current Study
No. of identified Species	59	66	74
Price range (Php/kg)	90-443.32	80-500	90-1200
Size range (mm)	63-565	25-563	40-890
No. of sources	7	8	7
Period of the Study	Nov 2018-Feb 2019	Sept 2019 - Jan 2020	Dec 2020 - Feb 2021

Table 1. Comparison of results between this study and previous iterations

There was an observed increase in the number of species identified, which were classified into 29 families. There was an increase in both the number of identified species and the price range and size range of the fish placed in the market. This implies that the domain of the market is constantly expanding, where the diversity of species found in the market is becoming more and more accessible to the general public.

A possible reason behind this is the effects of the nationwide quarantine for COVID-19. Since the entire population, fishers included were prohibited from carrying on their usual fishing activities in places like Malabon, Lucena, and Batangas. The

aquatic habitats were able to replenish themselves in terms of population. The prohibition in accessing these former fishing spots may also have contributed to the environmental rehabilitation of said habitats (Ocean Conservation Trust, 2020); thus, the fish could grow stronger, as observed in their increased lengths.

3.3. Correlation Study

For the correlation studies, the data was initially organized according to the families they fall under. After this data set was run through the correlation analysis, the figures were re-organized by their respective species and were once again run through the correlation studies.

3.3.1 Price by Length of Fish

As organized by family, the correlation study showed a coefficient of 0.0152 or a negligible correlation, as illustrated in Figure 6, where the graph is almost parallel to the x-axis. But, when re-organized according to their respective species, 12 species showed a high to very high positive correlation between the length and price of fish sold in the market, as seen in Table 2.

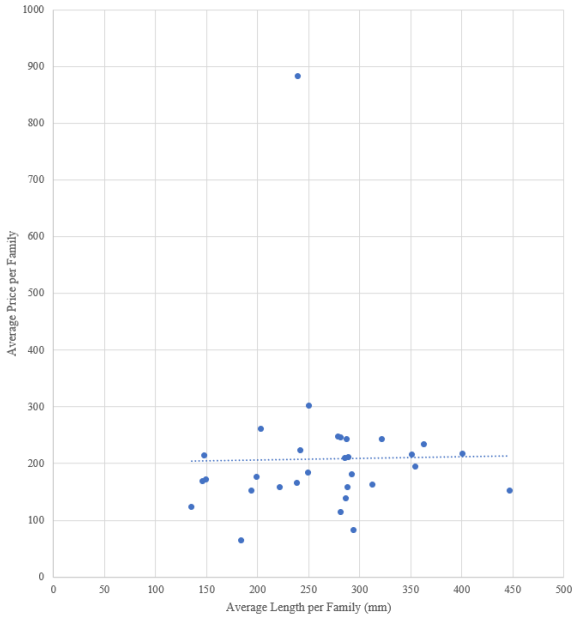

Figure 6. *Effect of Average Length on Average Price Per Family*

Table 2. *Effect of Length on Price of Fish per Species*

Species	Pearson's Correlation Coefficient	Interpretation
Nibea soldado	0.9981	Very high positive correlation
Pomadasys argenteus	0.9631	Very high positive correlation
Pomadasys kaakan	0.8267	High positive correlation
Pterocaesio digramma	0.9918	Very high positive correlation
Stolephorus waitei	0.9304	Very high positive correlation
Priacanthus hamrur	0.7917	High positive correlation
Plectropomus leopardus	0.7569	High positive correlation
Selar crumenophthalmus	0.9516	Very high positive correlation
Lutjanus madras	0.7321	High positive correlation
Upeneus moluccensis	0.9859	Very high positive correlation
Sphyraena obtusata	0.8042	High positive correlation
Katsuwonus pelamis	0.8041	High positive correlation

3.3.2. Price by Source of Fish

According to their respective families, the species under the families *Engraulidae*, *Priacanthidae,* and *Serranidae* showed a very high positive correlation, as shown in Table 3. This was interpreted as the source being a factor in the quality of the fish sold, which implies a higher price.

Table 3. *Effect of Source on Average Price of Fish by Family*

Family	Pearson's Correlation Coefficient	Interpretation
Engraulidae	0.9112	Very high positive correlation
Priacanthidae	0.9966	Very high positive correlation
Serranidae	0.9113	Very high positive correlation

Logistically, it is more efficient to source aquaculture from closer sources, such as Navotas or Malabon, both in Metro Manila. However, the quality of water found in these places is questionable. According to Santos et al. (2017), the presence of nitrates (N-NO3) in the waters of Manila Bay exceeds the critical value dictated by ASEAN, which creates conditions that make it difficult for fish to live in. Likewise, this determines the degree of pollution in the area. In comparison, the water pollution levels of Metro Manila are at 83.56%, while that of Lucena is at 70.45% (Numbeo, 2021), making the aquaculture from Lucena safer and more fit for consumption. As per individual species, only *Priacanthus hamrur* showed a significant correlation value of 0.9966. This is because the species was sourced from three different locations but being the most expensive when sourced from Lucena.

3.3.3. Price Progression of Fish

Three representative species from each price range were included in the comparison so that all three price ranges would be constituted.

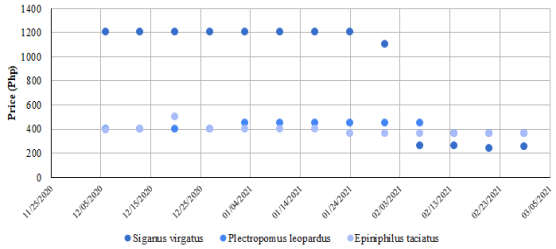

Figure 7. *Price progression of three most expensive Species*

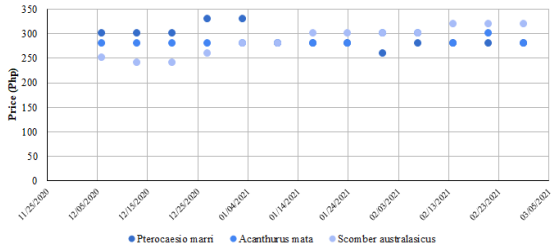

Figure 8. *Price progression of three Mid-Range Species*

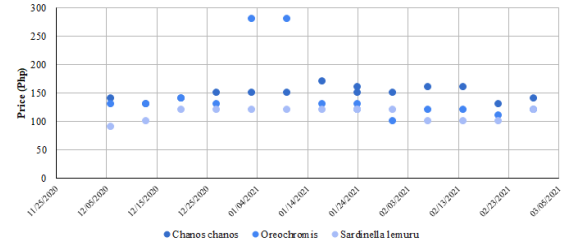

Figure 9. *Price progression of three Least Expensive Species*

The prices were at a steady constant in the more expensive range, except for *Siganus virgatus*, which experienced a steep drop, as seen in Figure 7. On the other hand, the mid-range priced species in Figure 8 showed a steady but significant increase in price, similar to those in the lower price range, as seen in Figure 9.

Despite the increase in species observed in the market, the prices are still steady despite the predicted decrease due to the supply-demand relationship. The cause of increased costs is the escalating difficulty in providing these quantities due to the rapid degradation of our aquatic ecosystems. According to Abreo (2018), the Pasig River alone contributes 3.21 x 10^4 tons of plastic per year, and the interaction between marine biodiversity and this waste is inevitable. The proportion between habitable water and plastic waste is critical to the ecosystems where our fishermen are supposed to source their livelihood and is detrimental to both.

4. CONCLUSION AND RECOMMENDATIONS

In today's world, the rise of carbon emissions, waste products, and the like continue to threaten the sustainability and quality of the marine ecosystem, as observed in the results of this study. The market is more diverse than in the past; new species have been identified and successfully farmed. However, cross-regional transportation still poses a threat to the efficiency of the market, which in turn affects the processes of the economy. Since the aquacultural aspect of the biosphere is subject to change every day, monitoring the fish once per week may not be sufficient. To improve the research in possible future continuations, the researchers think that it is best to conduct the monitoring of the sector more frequently. In addition to this, the researchers believe that observing them in a laboratory to assess their overall health and condition will add a more in-depth assessment of the quality of fish in the study.

5. ACKNOWLEDGMENTS

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